CLAIMS

1. An internal surface chucking mechanism (ISM) comprising a coupling mechanism (103, 105, 107) activable for gripping and for release of a workpiece (W) in process on a processing machine, the workpiece defining an external surface and an internal surface configured for access from the outside,
the processing machine comprising:

an inner chamber (70) defining an axis (A) and a volume of space inside the processing machine,

an external surface chucking mechanism (EXS) releasably and retrievably retained in axial alignment in the inner chamber and configured for gripping and for releasing an external surface of the workpiece in process on the processing machine, and

a push rod (7) operatively associated with the EXS to controllably command gripping and release of the external surface of the workpiece in process,
characterized in that:

the ISM comprises a bushing (101) defining a bushing outside and a bushing inside, the bushing outside being configured to be retrievably received in axial alignment inside the inner chamber (70), and the bushing inside being configured for receiving the coupling mechanism (103, 105, 107), and

the ISM is configured for insertion and retention in the inner chamber to provide reversible exchange in replacement of the EXS, for operative association with the push rod to activate the coupling mechanism, and for retrieval from the inner chamber,

whereby retrieval of the EXS from the inner chamber and insertion therein of the IMS in replacement, provides operation of the processing machine in a first configuration with an EXS, and in a second configuration with an ISM, and *vice versa*.

2. The ISM according to Claim 1, further characterized in that

the ISM is operable with a processing machine operating a process selected, alone and in combination, from the group of processes consisting of material removal, fastening, joining, surface treatment, and quality assurance.

3. The ISM according to Claim 1 or 2, further characterized in that

the ISM is configured for operation both when rotative and when non-rotative.

4. The ISM according to Claim 1 or 2, further characterized in that
the ISM is operable with a processing machine comprising a rotating spindle (3).

5. The ISM according to Claim 1 or 2, further characterized in that
the ISM and the EXS are mutually and reversibly exchangeable *in situ*.

6. The ISM according to Claim 1 or 2, wherein
the processing machine defines an initial external configuration when operating an EXS, and
the ISM is further characterized in that
exchange of the EXS with the ISM maintains unaltered the initial external configuration of the processing machine.

7. The ISM according to Claim 1 or 2, further characterized in that
the ISM is configured for operation both when rotative and when non-rotative, and
the ISM and the EXS are mutually and reversibly exchanged *in situ*.

8. An internal surface chucking mechanism (ISM) comprising a coupling mechanism (301, 303, 351) activable for gripping and for release of a workpiece (W) in process on a processing machine, the workpiece defining an external surface and an internal surface configured for access from the outside,
the processing machine comprising:
an inner chamber (70) defining an axis (A) and a volume of space inside the processing machine,
an external surface chucking mechanism (EXS) releasably and retrievably retained in axial alignment in the inner chamber and configured for gripping and for releasing the external surface of the workpiece in process on the processing machine, and
a push rod (70) operatively associated with the EXS to controllably command gripping and release of the external surface of the workpiece in process,
characterized in that:
the ISM comprises at least one fluid flow inlet (311) coupled in fluid flow communication to at least one exit bore (353) for fluid flow outlet, the former receiving a flow of fluid under pressure from at least one source of fluid and the latter discharging a controlled stream of fluid flow, and
the at least one exit bore is oriented and located respectively, toward and adjacent the workpiece, for aiming discharge of the controlled stream of fluid to impinge on and to eject the workpiece from the ISM when the coupling mechanism is activated to release the workpiece,

whereby the ISM is configured for controlled ejection of the workpiece.

9. The ISM according to Claim 8, further characterized in that
the controlled stream of fluid acts on either one and on both the ISM and the workpiece (W) by performing a function selected alone and in combination form the group of functions consisting of cooling and of lubricating.

10. The ISM according to Claim 8 or 9, further characterized in that
the fluid is defined as an oil.

11. The ISM according to Claim 8 or 9, further characterized in that
the fluid is defined as an oil, and
the oil is selected alone and in combination from the group of oils consisting of cooling oils and lubrication oils.

12. The ISM according to Claim 8, further characterized in that
the ISM defines an inside and an outside, and
the controlled stream of fluid flow is discharged from the inside of the ISM to the outside.

13. The ISM according to Claim 8 or 12, further characterized in that
the ISM defines an inside and an outside, and
the ISM further comprises slits (178) providing passage for fluid flow communication from the inside of the ISM to the outside, and
the controlled stream of fluid is discharged from the inside of the ISM via the at least one exit bore (353) and via the slits comprised in the ISM,
whereby ingression of matter from the outside to the inside of the ISM is prevented.

14. The ISM according to Claim 8 or 12, further characterized in that
the ISM is cooled and lubricated on the inside.

15. A method for providing an internal surface chucking mechanism (ISM) comprising a coupling mechanism (103, 105, 107) activable for gripping and for release of a workpiece (W) in process on a processing machine, the workpiece defining an external surface and an internal surface configured for access from the outside,
the processing machine comprising:
an inner chamber (70) defining an axis and a volume of space inside the processing machine,

an external surface chucking mechanism (EXS) releasably and retrievably retained in axial alignment in the inner chamber and configured for gripping and for releasing the external surface of the workpiece in process on the processing machine, and

a push rod (7) operatively associated with the EXS to controllably command gripping and release of the external surface of the workpiece in process,

characterized by the steps of:

providing a bushing (101) comprising an outside and an inside, the bushing outside being configured to be retrievably received in axial alignment inside the internal chamber (70), and the bushing inside being configured for receiving the coupling mechanism (103, 105, 107),

configuring the ISM for insertion and retention in the inner chamber to provide reversible exchange in replacement of the EXS, for operative association with the push rod to activate the coupling mechanism, and for retrieval from the inner chamber, and

retrieving the EXS from the inner chamber and inserting therein of the IMS in replacement, for providing operation of the processing machine in a first configuration with an EXS, and in a second configuration with an ISM, and *vice versa.*

16. The method according to Claim 15, further characterized by the step of

operating the ISM with a processing machine running a process selected, alone and in combination, from the group of processes consisting of material removal, fastening, joining, surface treatment, and quality assurance.

17. The method according to Claim 15 or 16, further characterized by the step of configuring the ISM for operation both when rotative and when non-rotative.

18. The method according to Claim 15 or 16, further characterized by the step of operating the ISM is with a processing machine comprising a rotating spindle (3).

19. The method according to Claim 15 or 16, further characterized by the step of replacing the ISM with the EXS *in situ,* in mutual and reversible exchange.

20. The method according to Claim 15 or 16, wherein

the processing machine defines an initial external configuration when operating an EXS, and

the method is further characterized by the step of

maintaining the initial external configuration of the processing machine unaltered after exchange of the EXS with the ISM.

21. The method according to Claim 15 or 16, further characterized by the steps of configuring the ISM for operation both when rotative and when non-rotative, and replacing the ISM with the EXS *in situ,* in mutual and reversible exchange.

22. A method for providing an internal surface chucking mechanism (ISM) comprising a coupling mechanism (301, 303, 351) activable for gripping and for release of a workpiece (W) in process on a processing machine, the workpiece defining an external surface and an internal surface configured for access from the outside,
the processing machine comprising:
an inner chamber (70) defining an axis and a volume of space inside the processing machine,
an external surface chucking mechanism (EXS) releasably and retrievably retained in axial alignment in the inner chamber and configured for gripping and for releasing the external surface of the workpiece in process on the processing machine, and
a push rod (7) operatively associated with the EXS to controllably command gripping and release of the external surface of the workpiece in process,
characterized by the steps of:
configuring the ISM to comprise both at least one fluid flow inlet (311) coupled in fluid flow communication to at least one exit bore (353) for fluid flow outlet, the former receiving a flow of fluid under pressure from at least one source of fluid and the latter discharging a controlled stream of fluid, and
orienting and locating the at least one exit bore respectively, toward and adjacent the workpiece for aiming discharge of the controlled stream of fluid to impinge on and to eject the workpiece from the ISM when the coupling mechanism is activated to release the workpiece,
whereby the ISM is configured for controlled ejection of the workpiece.

23. The method according to Claim 22, further characterized by the step of
acting with the controlled stream of fluid on either one and on both the ISM and the workpiece (W) by performing a function selected alone and in combination form the group of functions consisting of cooling and of lubricating.

24. The method according to Claim 22 or 23, further characterized by the step of defining the fluid as an oil.

25. The method according to Claim 22 or 23, further characterized by the step of defining the fluid is as an oil, and

selecting the oil alone and in combination from the group of oils consisting of cooling oils and lubrication oils.

26. The method according to Claim 22, further characterized by the steps of
defining an ISM inside and an ISM outside, and
discharging the controlled stream of fluid flow from the inside of the ISM to the outside of the ISM.

27. The method according to Claim 22 or 26, further characterized by the steps of
defining an ISM inside and an ISM outside, and
providing passage for fluid flow communication from the inside of the ISM to the outside of the ISM via slits (178) comprised in the ISM, and
discharging the controlled stream of fluid is from the inside of the ISM to the outside via the at least one exit bore (353) and via the slits comprised in the ISM, whereby ingression of matter from the outside to the inside of the ISM is prevented.

28. The method according to Claim 22 or 26, further characterized by the step of
cooling and lubricating the ISM on the inside.